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Abstract

U. S. EXPERIENCE WITH REACTOR SAFETY AND SITING

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Basically, the only unique potential hazard to the health and safety of the general public presented by the operation of a nuclear reactor arises from the possibility that radioactive materials generated in the reactor in the course of its operation might somehow escape and find their way in dangerous amounts into populated areas. It follows that safety of the public can be assured if means can be found to prevent escape of hazardous amounts of radioactive materials into public areas. Efforts to obtain such assurance are focused on two principal areas:

1. Design, construction and operation of reactors such that they possess adequate safeguards both for prevention of accidents and for minimizing consequences of accidents, and

2. Location of reactors such that isolation distances and other site characteristics are appropriate.

The paper summarizes some of the basic safety principles applicable to design, construction and operation of power reactors and describes the concepts on which our current guides to selection of reactor site rest. Consideration of the siting problem includes a discussion of the roles assigned to "maximum credible accidents" and "exposure dose indices", the possibility of reduced distance requirements as dependability of engineering safeguards improves, a preliminary list of principles relating to the evaluation of individual safeguards, and an indication of the present trend in reactor siting in the United States.

To the present time more than 225 reactors of assorted types and power levels have been built and operated in the United States ... for a surprisingly large total number of accumulated reactor years and megawatt days of operating

experience. For the 20 licensed power reactors alone (four of which are still at low levels of initial operation), more than 1½ million megawatt days of operation have been logged in the six years of time since the first one started. Not a single significant reactor accident (i.e., one that caused consequent damage to people or to the facility) has occurred.

For the other 200 odd assorted reactors: research, test, power (governmental), propulsion and production, a far more impressive operating record (now being compiled for up-to-date totals) has been logged. These reactors have been operated over a span of over 20 years in all sorts of experimental and test programs as well as in steady state condition, and at times when our knowledge was far less extensive than at present. Yet, during this total operation only 15 reactor accidents have occurred which caused either injury to people (three have been killed, all in one accident), damage to the facility, or major unintended increases in power level (without attendant damage).

A brief discussion of these accidents and their implications for reactor safety is given.

As an appendix, this paper contains a description of current administrative and procedural practices in safety evaluation, licensing, inspection and surveillance of licensed reactors in the United States.